

Claims

1. A process for producing metal oxide from metal compounds, in particular metal hydroxide or metal carbonate, in which the metal compound is conveyed into a reactor (25) with fluidized bed, heated there to a temperature of 650 to 1150°C by combustion of fuel, and metal oxide is generated, **characterized in** that a first gas or gas mixture is introduced from below through a gas supply tube (26) into a mixing chamber (20) of the reactor (25), the gas supply tube (26) being at least partly surrounded by a stationary annular fluidized bed (27) which is fluidized by supplying fluidizing gas, and that the velocities of the first gas or gas mixture as well as of the fluidizing gas for the annular fluidized bed (27) are adjusted such that the Particle-Froude numbers in the gas supply tube (26) lie between 1 and 100, in the annular fluidized bed (27) between 0.02 and 2, and in the mixing chamber (20) between 0.3 and 30.
2. The process as claimed in claim 1, **characterized in** that the Particle-Froude number in the gas supply tube (26) lies between 1.15 and 20.
3. The process as claimed in claim 1 or 2, **characterized in** that the Particle-Froude number in the annular fluidized bed (27) lies between 0.115 and 1.15.
4. The process as claimed in any of the preceding claims, **characterized in** that the Particle-Froude number in the mixing chamber (20) lies between 0.37 and 3.7.
5. The process as claimed in any of the preceding claims, **characterized in** that the filling level of solids in the reactor (25) is adjusted such that the annular fluidized bed (27) extends beyond the upper orifice end of the gas supply tube (26) and that solids are constantly introduced into the first gas or gas mixture and entrained by the gas stream to the mixing chamber (20) located above the orifice region of the gas supply tube (26).
6. The process as claimed in any of the preceding claims, **characterized in** that as starting material aluminum hydroxide with a grain size of less than 100 μm is supplied.

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7. The process as claimed in any of the preceding claims, **characterized in that** preheated gas containing oxygen is supplied to the reactor (25) through the gas supply tube (26).

5 8. The process as claimed in any of the preceding claims, **characterized in that** gaseous and/or liquid fuel is introduced into the reactor (25) through the gas supply tube (26), the fuel preferably being supplied in the vicinity of the outlet opening of the gas supply tube (26).

10 9. The process as claimed in any of the preceding claims, **characterized in that** gaseous fuel and/or air is introduced into the lower region of the annular fluidized bed (27) of the reactor (25).

15 10. The process as claimed in any of the preceding claims, **characterized in that** the pressure in the reactor (25) lies between 0.8 and 10 bar.

20 11. The process as claimed in any of the preceding claims, **characterized in that** before the heat treatment in at least one preheating stage (A, B), comprising a heat exchanger (3, 4) and a downstream separator (6, 18), the solids are suspended, dried, preheated and/or partly calcined.

25 12. The process as claimed in claim 11, **characterized in that** an annular-fluidized-bed heat exchanger (70, 71) with a stationary fluidized bed (72) and a mixing chamber (73) is used as heat exchanger.

13. The process as claimed in any of the preceding claims, **characterized in that** cooling the reactor (25) and/or an annular-fluidized-bed heat exchanger (70, 71) is effected by injecting water into the annular fluidized bed (27, 72).

30 14. The process as claimed in any of claims 11 to 13, **characterized in that** after the heat treatment 0 to 100 % of the product entrained by the exhaust gas of the reactor (25) are discharged via a separator (34) into a preferably fluidizing-gas-operated mixing vessel (34), and a product mixture is generated with partly calcined solids.

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15. The process as claimed in any of the preceding claims, **characterized in** that the product or product mixture is supplied to a cooling system (40) which in particular consists of an arrangement of a plurality of cooling stages (D, E, F, G, H) connected in series.

16. The process as claimed in claim 15, **characterized in** that the gas heated in the cooling stage (D, E, F, G, H) is supplied to an upstream cooling stage (D, E, F, G), a preheating stage (A, B) and/or the reactor (25).

17. A plant for producing metal oxide from metal compounds, such as metal hydroxide or metal carbonate, in particular for performing a process as claimed in any of claims 1 to 16, comprising a reactor (25) constituting a fluidized-bed reactor, in which the metal compound is heated by combustion of fuel and metal oxide is generated, **characterized in** that the reactor (25) has a gas supply system which is formed such that gas flowing through the gas supply system entrains solids from a stationary annular fluidized bed (27), which at least partly surrounds the gas supply system, into the mixing chamber (20).

18. The plant as claimed in claim 17, **characterized in** that the gas supply system has a gas supply tube (26) which in the lower region of the reactor (25) extends substantially vertically upwards into the mixing chamber (20) of the reactor (25), the gas supply tube (26) being surrounded by a chamber which at least partly annularly extends around the gas supply tube (26) and in which the stationary annular fluidized bed (27) is formed.

19. The plant as claimed in claim 18, **characterized in** that the gas supply tube (26) is arranged approximately centrally, based on the cross-sectional area of the reactor (25).

20. The plant as claimed in any of claims 17 to 19, **characterized in** that a separator (34) for separating solids is provided downstream of the reactor (25), and that the

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separator (34) has a solids return conduit (15a) leading to the annular fluidized bed (27) of the reactor (25) and a solids conduit (15) leading to a mixing vessel (14).

21. The plant as claimed in any of claims 17 to 20, **characterized in** that in the annular chamber of the reactor (25) a gas distributor (29) is provided, which divides the annular chamber into an upper annular fluidized bed (27) and a lower gas distributor chamber (24), and that the gas distributor chamber (24) is connected with a supply conduit (21) for fluidizing gas.

22. The plant as claimed in any of claims 17 to 21, **characterized in** that the reactor (25) has a supply conduit for gaseous and/or liquid fuel, which leads to the gas supply system, and/or a supply conduit (21) for gaseous, liquid and/or solid fuel, which leads to the annular chamber.

23. The plant as claimed in claim 22, **characterized in** that in the gas supply system, in particular in the gas supply tube (26), a lance (30) is arranged for supplying gaseous and/or liquid fuel, which lance extends into the region of the outlet opening of the gas supply system, in particular the gas supply tube (26).

24. The plant as claimed in any of claims 17 to 23, **characterized in** that an annular-fluidized-bed heating stage (70, 71) with a chamber for a stationary annular fluidized bed (72) and a mixing chamber (73) is provided as preheating stage (A, B).

25. The plant as claimed in any of claims 17 to 24, **characterized in** that downstream of the reactor (25) a preferably fluidizing-gas-operated mixing vessel (34) is provided for mixing the product with partly calcined solids to obtain a product mixture.

26. The plant as claimed in any of claims 17 to 25, **characterized in** that a cooling system (40) for the product or product mixture has a fluidized-bed cooler (37) with at least one vertical weir (56, 57), before which the product or product mixture forms a fluidized bed.